

## **CHAPTER 4: RESULTS**

### **4.1 Prevalence of ECC, Nutritional Status, Dietary Habits and Knowledge, Attitude and Practices (K/A/P) of mothers in proxy population (5-6 year old children).**

#### **4.1.1 Socio-demographic characteristics of proxy population (5-6 years old)**

The majority of mothers (87.5%) and fathers (85.1%) were between 20-49 years old. All (100%) of them were Malays. The majority of mothers (70.2%) and fathers (62.6%) had at least secondary education. However, most mothers (72.4%) were not working while all the fathers were employed. More than one-half (58.4%) have large families (>6 members) and almost two-thirds (62.2%) earned incomes below the poverty line.

More than three-quarters of the families spent less than RM500 on food. About one-half got their main water supply from wells (49.5%) and others sources (4.6%) (eg. river, pond and underground water) (Table 4.1).

#### **4.2.2 Early Childhood Caries of Proxy Population (5-6 years old).**

The overall mean dmf was 10.6; of which the largest contributor to the dmf score was the decay component ( $d=10.5$ ,  $SD= 4.8$ ) while missing ( $m=0.14$ ,  $SD= 0.7$ ) and filled teeth ( $f=0.04$ ,  $SD= 0.5$ ) was very low (Table 4.1.2 (a)). Meanwhile, almost every child was affected by caries (97.9%). The majority; ie more than three-quarters (78.6%) have more than 7 teeth affected by caries. There were no significant differences between Tumpat and Pasir Mas districts ( $p=0.426$ ) (Table 4.2(a), 4.2(b)).

Table 4.1 Overall Socio Demographic Distribution of Proxy Population (5-6 years old)

SES Variables	N=527 (%)	
	Mothers n (%)	Fathers n (%)
Parents age category		
19-29 years	82 (15.6)	31(5.9)
20-39 years	295 (56.0)	219(41.6)
40-49 years	145 (27.5)	229(43.5)
> 50 years	5 (0.9)	48(9.1)
Race		
Malays	527 (100)	527(100)
Chinese	0	0
Indians	0	0
Others	0	0
Parents/guardians level of education		
Primary	64(12.1)	85(16.1)
Secondary	370(70.2)	330(62.6)
Tertiary	93(17.6)	112(21.3)
Parents/guardians occupations		
Not working	391(72.4)	0
Employee	82(15.6)	274(52.0)
Employer	54(10.2)	253(48.0)
Household size		
< 5 person	219(41.6)	
6 to 10 person	292(55.4)	
> 10 person	16(3.0)	
Household income		
< RM720	328(62.2)	
>RM720	199(37.8)	
Household expenditure for food		
<RM500	418(79.3)	
RM501- RM2000	105(19.9)	
>RM2001	4(0.8)	
Water supply		
Well (well, or well with pump)	261(49.5)	
Piped water (state water supply)	242(45.9)	
Rain	1(0.2)	
Others	23(4.4)	

Table 4.2 (a) Early Childhood Caries (dmf status) in Proxy Population (5-6 years old)

	dmf Mean(sd)	d Mean(sd)	m Mean(sd)	f Mean(sd)
All	10.6(4.9)	10.5(4.8)	0.14(0.7)	0.04(0.5)
Tumpat	10.2(5.1)	9.9(4.9)	0.25(0.9)	0.04(0.6)
Pasir Mas	11.1(4.8)	10.9(4.8)	0.06(0.4)	0.03(0.4)

Table 4.2 (b) Early Childhood Caries Category of Proxy Population (5-6 years old)

Caries category	All n (%)	Tumpat n (%)	Pasir Mas n (%)
No caries	10(1.9)	7(3.0)	3(1.0)
Low (below 3)	37(7.0)	17(7.3)	20(6.8)
Moderate (4 to 6)	65(12.3)	31(13.3)	34(11.6)
High (more than 7)	414(78.6)	177(76.0)	237(80.6)
Total	527(100)	233(100)	294(100)

### 4.1.3 Nutritional Status for proxy population (5-6 years old).

#### 4.1.3.1 Nutritional Status: Anthropometry measurements for proxy population (5-6 years old).

Slightly less than one-half (47.8%) of the preschool children had normal weight, while the other one-half were underweight (50.5%) and only a few were overweight. There was no significant difference of weight-for-age (WAZ) between Tumpat and Pasir Mas districts ( $p=0.279$ ). More than one-third (about 40.1%) of the preschool children was stunted at various category of severity.

There is no significant difference of height-for-age (HAZ) between Tumpat and Pasir Mas districts ( $p= 0.308$ ). Less than one-third (31.1%) of preschool children were underweight; while about one in ten child (10.8%) were overweight/obese. There were more underweight children in Pasir Mas (36.1%) than Tumpat (24.9%), but the

differences were not statistically significant between these two locations for BMI-for-age ( $p=0.101$ ) (Table 4.3).

Table 4.3 Nutritional Status: Anthropometry measurements for proxy population (5-6 years old)-Weight-for-age (WAZ), Height-for-age (HAZ) and BMI-for-age.

<b>Indicators</b>	<b>All n (%)</b>	<b>Tumpat n (%)</b>	<b>Pasir Mas n (%)</b>	<b><i>P</i> value</b>
<b>Weight-for-age category</b>				
Severe underweight (<-3sd)	10 (1.9)	2(0.9)	8(2.7)	0.279
Moderate underweight (-3sd to -2sd)	66(12.5)	24(10.3)	42(14.3)	
Underweight (-2sd to median)	190(36.1)	89(38.2)	101(34.4)	
Normal (median to <2sd)	252(47.8)	114(48.9)	136(46.9)	
Overweight(>2sd)	9(1.7)	4(1.7)	5(1.7)	
<b>Height-for-age category</b>				
Normal (above median)	316(60.0)	130(55.8)	186(63.3)	0.308
Stunting (-2sd to -1sd)	130(24.7)	57(24.5)	72(24.8)	
Moderate stunting (-3sd to -2sd)	57(10.8)	30(12.9)	27(9.2)	
Severe stunting (>-3sd)	24(4.6)	16(6.9)	8(2.7)	
<b>BMI-for-age category</b>				
Obesity (>2sd)	25(4.7)	17(7.3)	8(2.7)	0.101
Overweight (>1sd)	32(6.1)	16(6.9)	16(5.4)	
Normal (median to -1sd)	306(58.1)	142(60.9)	164(55.8)	
Underweight (<-2sd)	164(31.1)	58(24.9)	106(36.1)	

Level of significance was set at 0.05

#### **4.1.3.2 Nutritional Status: Nutrients intake and sugar intake for proxy population (5-6 years old).**

Out of eight nutrient intakes, seven types were not adequate in the daily diet as compared to daily recommended allowance (RDA). The intake of energy, fat, protein, calcium, zinc, vitamin C and vitamin A only fulfilled about two-thirds of the daily intake of children aged 4 to 6 years old. There was no significant difference in all nutrients intake data in both locations.

Iron intake was higher as compared to the recommended RNI (2005) (NCCFN, 2005) (ie. 121.5%- Tumpat, 119.8%- Pasir Mas). However, added sugar consumption of preschool children in Tumpat and Pasir Mas was more than three times higher (198.1%- Tumpat and 210.5%- Pasir Mas) than that recommended by WHO (2003) (Table 4.4).

Table 4.4 Nutritional Status: Nutrients intake and Comparison between daily dietary intakes with Malaysian RNI (Recommended Nutrient Intake) for proxy population (5-6 years old)

Nutrients	Recommended intake/day	All (n=527) Mean (SD) (%)	Tumpat (n=233) Mean (SD) (%)	Pasir Mas(n=294) Mean (SD) (%)	P value
*Energy (kcal)	1340-boys 1290-girls	1171.9(293.5) (87.4)	1188.5(295.0) (88.7)	1153.1(297.2) (86.1)	0.610 0.182
*Protein (g)	23	20.2(4.9) (87.9)	20.2(4.9) (87.9)	20.2(5.5) (87.7)	0.898
*Calcium (mg)	600	468.5(177) (78.1)	481.5(158.8) (80.2)	458.3(191.4) (76.4)	0.138
*Iron (mg)	6	7.2(2.3) (120.5)	7.3(2.2) (121.5)	7.2(2.3) (119.8)	0.407
*Zinc (mg)	5.1	4.0(1.9) (78.4)	4.1(1.5) (79.8)	3.9(2.1) (76.7)	0.330
*Vitamin C (mg)	30	25.1(14.4) (83.7)	26.0(11.5) (86.8)	24.4(16.3) (81.3)	0.193
*Vitamin A (ug)	450	394.1(200.3) (87.6)	412.4(182.1) (91.6)	379.7(212.9) (84.4)	0.063
**Fat (g)	52 -boys 50 -girls	41.8(15.9) (80.4)	41.7(16.22) (80.2)	41.8(15.7) (80.4)	0.865 0.437
***Added sugar (g)	60	123.0(61.8) (205.1)	118.9(57.0) (198.1)	126.3(65.3) (210.5)	0.170

Level of significance was set at 0.05

\*Recommended by Malaysia Nutrient Intake (2005)

\*\* Recommended by American Heart Association

\*\*\* Recommended by WHO (2003)

Percentage =

$$\frac{\text{Mean of nutrient intake/sugar}}{\text{RNI}} \times 100$$

#### **4.1.4(a) Dietary Habits: Intake Frequency of Sugary foods and drinks for proxy population (5-6 years old).**

About two-thirds (62.8%) of children in the proxy population consumed cocoa powder (with sugar or sweetened milk) locally known as “*Milo*” two to three times per day and it contributed to the highest score (84.6) of sugary foods and drinks intake. While, nearly one-half of children (43.5%) had eaten “*cokelat*” (ie. local slang for sweets) 2 to 3 times a day with the score of 75.3. The third highest score was 67.5 for consumption of ice-cream 2 to 3 times a day which affects nearly one-third of the children here.

Other favorite non-carbonated drink was syrup (score of 60.0), consisting nearly one-fourth (24.7%) of children who consumed it 2 to 3 times a day. With the score of 53.3, (sweet) soy drink was the third choice for children (24.7% consumed it 2 to 3 times a day).

Among sweets/candy types, milk chocolate was the second highest (score 56.2) where nearly one-third (21.3%) consumed it once a week and 15.7% ate it 2 to 3 times a day. Among the traditional Malaysia “*kuih*”, the highest score was doughnut (59.4). About one-fourth (25.2%) of children here consumed it once a week, while curry puffs was the second highest (score 54.8) where 8.1% consumed it 2 to 3 times a day.

The favorite biscuits/cookies was cream cracker with sugar (score 54.1) where 16.3% of children consumed it 2 to 3 times a day. Followed by *chipsmore/tiger biscuits* (score 50.1) where nearly one-third (15 %) of children consumed it at least once a week and 9.5% ate 2 to 3 times a day. Nearly one-fourth (25.8%) of children consumed raisins or other dried fruits 2 to 3 times a month, while 12.9% consumed it 2 to 3 times a day. The score for raisins/dried fruits was 51.4.

Finally, all types of cakes, morning breakfast, carbonated drinks (all brands), juices and desserts were not favorite choices among children based on low score below 50.0. (Table 4.5(a)).

#### **4.1.4(b) Dietary Habits: Intake Frequency of Fruits and Cariostatic Foods for proxy population (5-6 years old).**

Watermelon consumption was the highest (score 58.6) with more than one-quarter (27.9%) taking it once a week. About one-in-ten (13.3%) consumed watermelon 2 to 3 times a day. The second highest score was papaya (56.2) where more than one-fourth (27.9%) consumed it once a week.

About 16.5% consumed oranges 2 to 3 times a week which places it at third highest score (54.2); followed by banana consumption with a score of 53.9. For other local fruits such as mango (score 48.4) and guava (score 46.8), the score was lower than 50.

The consumption of imported fruits such as apples (score 44.8) and grapes (score 40.8) showed lower scores compared to local fruits. About one-thirds of consumption of imported fruits was for 3 times a month.

However, cariostatic foods such as yogurt were not so popular among preschool children based on the low overall score of 37.8. More than one-third (34.3%) consumed cariostatic food less frequently and only 1.3% consumed it 2 to 3 times a day (Table 4.5(b)).



Table 4.5(a) Dietary Habits: Intake Frequency of Sugary foods and drinks for proxy population (5-6 years old)

Type of foods	Less frequent (%)	Once a month (%)	2-3 times a month (%)	Once a week (%)	2-3 times a week (%)	Once a day (%)	2-3 times a day (%)	Score of FFQ
1). Cakes								
Plain cake	10.2	19.0	30.0	22.4	10.6	2.8	4.9	<b>47.4</b>
Chocolate cake	11.8	26.2	32.1	21.4	5.9	1.3	1.3	<b>42.1</b>
Banana cake	14.8	21.1	33.2	21.8	6.1	1.7	1.3	<b>41.9</b>
Fruit cake	33.8	21.4	26.4	13.1	3.8	0.6	0.9	<b>33.8</b>
Sponge cake	37.4	19.0	26.0	12.7	3.8	0	1.1	<b>24.6</b>
2). Biscuits/ Cookies								
Cream cracker biscuit with sugar	16.9	10.4	21.1	17.2	13.3	4.7	16.3	<b>54.1</b>
Chipsmore biscuit/tiger	12.7	12.3	24.1	23.0	15.0	3.4	9.5	<b>50.1</b>
Chocolate cookies	17.8	16.1	25.6	19.4	11.8	3.2	6.1	<b>46.5</b>
Marie biscuit	23.5	12.9	24.5	17.5	10.6	3.4	7.6	<b>45.6</b>
Coconut biscuit	47.2	15.2	21.1	9.5	3.6	1.9	1.5	<b>31.3</b>

3)Sweets/Candy									
“Cokelat” (all typers of sweets)	6.1	2.5	10.2	16.1	13.5	8.2	43.5	<b>75.3</b>	
Milk chocolate	12.0	12.0	18.6	21.3	15.7	4.7	15.7	<b>56.2</b>	
Wafer (krim,coklat dll)	29.4	10.2	18.4	18.4	11.6	5.1	6.8	<b>44.7</b>	
KitKat chocolate	29.2	16.9	26.6	16.7	6.6	1.5	2.5	<b>38.4</b>	
Chocolate with raisin	37.8	13.3	18.6	15.7	8.2	1.3	5.1	<b>38.2</b>	
4). Traditional Malaysian <i>kuih</i>									
Donut	5.1	9.1	18.8	25.2	22.6	11.8	7.4	<b>59.4</b>	
Curry puff	11.0	10.6	22.0	22.8	16.3	9.3	8.1	<b>54.8</b>	
Pulut panggang	28.1	12.5	21.8	18.0	11.8	5.1	2.7	<b>42.7</b>	
Kuih Akok	19.0	17.5	29.4	20.3	9.1	3.0	1.7	<b>42.7</b>	
Kuih Bahulu	21.3	16.5	27.9	22.0	7.2	4.4	0.8	<b>42.0</b>	
Kuih bom/lengur	39.8	13.3	18.0	17.1	6.8	4.0	0.9	<b>41.8</b>	
Kuih seri muka	45.7	10.4	18.4	16.5	5.9	1.9	1.1	<b>40.3</b>	
Kuih lapis	31.1	13.5	21.3	18.6	11.0	3.2	1.3	<b>40.0</b>	
Kuih Pau	30.9	16.3	21.4	17.6	9.5	3.2	0.9	<b>38.7</b>	
Lopat tikam	33.2	16.7	23.1	17.6	4.9	3.0	1.3	<b>36.8</b>	
Kuih Apam	39.5	13.9	18.0	15.9	9.3	2.1	1.3	<b>36.2</b>	
Kuih kasui	45.9	12.9	17.3	11.4	8.3	2.8	1.3	<b>33.8</b>	
Jala Mas	65.5	10.6	15.6	4.7	2.1	1.5	0	<b>24.5</b>	
Bunga tanjung	72.5	8.0	11.8	4.9	1.9	0.4	0.6	<b>22.8</b>	

Tahi itik	75.3	7.0	11.4	4.0	1.5	0.4	0.4	<b>21.7</b>
<b>5). Morning Breakfast</b>								
Coco crunch	16.7	14.8	22.0	20.3	12.7	13.5	0	<b>48.3</b>
Emping jagung (Corn flakes)	42.9	12.7	20.7	12.3	6.5	4.9	0	<b>34.5</b>
Bran flakes	59.2	9.9	11.2	9.7	5.9	4.2	0	<b>29.4</b>
<b>6). Non-carbonated drink</b>								
“Milo”/ Chocolate drink (with sugar or sweetened milk)	1.3	2.7	7.6	10.1	10.4	5.1	62.8	<b>84.6</b>
Syrup	11.2	5.9	17.5	18.8	15.7	6.3	24.7	<b>60.0</b>
Soy drink (sweet)	12.9	10.6	21.6	24.1	15.4	6.5	8.9	<b>53.4</b>
Ribena	26.8	14.2	18.8	15.9	12.0	3.8	8.5	<b>45.4</b>
Cordial “Slurpy”	42.3	14.0	16.1	12.9	8.2	3.8	2.7	<b>36.1</b>
	79.3	8.3	7.4	2.8	1.1	0.2	0.8	<b>20.2</b>
<b>7). Carbonated drink (all brands)</b>								
	33.0	17.1	21.1	10.2	6.8	3.8	8.0	<b>40.6</b>

<b>8). Juices</b>									
Orange juice	25.2	12.9	21.1	20.3	13.1	3.4	4.0	<b>44.2</b>	
Grape juice	45.2	12.5	19.7	12.1	5.7	2.5	2.3	<b>33.9</b>	
Lemon juice	48.4	12.0	18.6	11.6	5.5	2.8	1.1	<b>32.4</b>	
Apple juice	51.6	12.3	18.6	10.6	4.0	1.9	0.9	<b>30.3</b>	
Pineapple juice	67.9	8.9	13.7	5.1	2.7	1.5	0.4	<b>24.6</b>	
<b>9). Desserts</b>									
“Bubur kacang hijau”	15.7	23.9	29.2	20.7	8.7	0.9	0.8	<b>41.2</b>	
“Pangat pisang”	24.4	24.7	30.6	12.9	6.5	0.9	0	<b>36.4</b>	
“ColeRojak (mee,buah)”	44.8	14.2	21.1	10.6	6.1	1.7	1.5	<b>32.9</b>	
“Bubur kacang merah”	49.0	17.6	19.9	9.1	3.2	0.2	0.9	<b>29.1</b>	
“Pangat keledak”	48.8	20.9	18.2	8.0	3.8	0.2	0.2	<b>28.4</b>	
<b>10). Raisins and other dried fruits</b>	<b>16.1</b>	<b>12.0</b>	<b>25.8</b>	<b>17.6</b>	<b>12.0</b>	<b>3.6</b>	<b>12.9</b>	<b>51.4</b>	
<b>11). Miscellaneous</b>									
Ice-cream	4.4	4.4	18.0	20.1	19.9	7.2	26.0	<b>67.5</b>	
“Kaya”	24.1	9.3	21.3	20.7	13.7	6.1	4.9	<b>46.9</b>	
Jem	40.0	13.9	21.6	13.1	6.3	2.8	2.3	<b>35.6</b>	
Lolipop	48.4	10.1	16.3	11.4	6.3	4.7	2.8	<b>34.6</b>	
“Lok Chen”	44.2	14.6	19.0	10.1	8.2	3.4	0.6	<b>33.8</b>	
Honey	47.2	14.8	15.9	10.1	6.5	2.1	3.4	<b>33.4</b>	

Table 4.5(b) Dietary Habits: Intake Frequency of Fruits and Cariostatic Foods for proxy population (5-6 years old)

Type of foods	Less frequent (%)	Once a month (%)	2-3 times a month (%)	Once a week (%)	2-3 times a week (%)	Once a day (%)	2-3 times a day (%)	Score of FFQ
1). Fruits								
Apple	17.3	17.1	27.5	20.7	11.0	2.8	2.8	<b>44.8</b>
Mango	13.3	14.1	26.9	22.4	13.7	6.6	2.7	<b>48.4</b>
Papaya	63.0	19.9	29.8	27.9	9.7	4.4	2.1	<b>56.2</b>
Grapes	17.1	20.3	34.9	18.2	6.8	1.5	1.1	<b>40.8</b>
Orange	10.2	9.9	23.3	24.5	16.5	9.7	5.9	<b>54.2</b>
Banana	8.3	9.1	26.8	26.4	16.5	8.2	4.7	<b>53.9</b>
Watermelon	7.8	8.5	19.9	27.9	14.4	8.2	13.3	<b>58.6</b>
Guava	22.2	12.7	22.0	18.8	11.4	8.5	4.4	<b>46.8</b>
2). Cariostatic food (yogurt)	34.3	14.6	21.3	15.9	9.5	3.0	1.3	<b>37.8</b>

#### **4.1.5 Knowledge, Attitude and Practices (K/A/P) for proxy population (5-6 years old).**

The mean knowledge score of the proxy population were  $11.38 \pm 2.29$  (95% CI: 11.13, 11.63). More than two-thirds (68.1%) of parents have moderate knowledge of nutrition and oral health (Table 4.6). Only one-quarter (26.4%) of the parents or guardians in the proxy population had high knowledge who gave correct answers scoring 14 or above. The result also showed that, about 1 in 20 (5.6%) had very low knowledge of nutrition and oral health.

Mean attitude score was  $3.24 \pm 1.36$  (95% CI: 3.13, 3.36) for both locations with more than one-half (52%) who scored moderate attitude. The percentage among parents with low attitude scores was twice higher (30.9%) as compared to high category (17.1%) in both locations.

More than one-third (39.4%) of parents or guardians in both locations had high practices score. The mean of practices score was  $8.86 \pm 2.09$  (95% CI: 8.68, 9.04) where the minimum correct answer was 1 and maximum correct answer was 13. Thus, practices scores in nutrition and oral health showed that more than one-half (56.4%) of parents or guardians had moderate practices while about 1 in 20 parents (4.2%) had low scores in practices in both locations (Table 4.7).

Table 4.6 Knowledge, Attitude and Practices scores of Proxy Population (5-6 years old)

Variable	All (n=527)		Locations Tumpang (n=233)		Pasir Mas(n=294)	
	Mean (sd)	95% CI	Mean(sd)	95% CI	Mean(sd)	95% CI
Knowledge	11.38(2.92)	11.13, 11.63	11.12(3.18)	10.71, 11.53	11.59(2.68)	11.28, 11.90
Attitude	3.24(1.36)	3.13, 3.36	3.18(1.39)	3.00, 3.36	3.30(1.33)	3.14, 3.45
Practices	8.86(2.09)	8.68, 9.04	8.82(2.37)	8.52, 9.13	8.89(1.86)	8.68, 9.10

Table 4.7 Category of Knowledge, Attitude and Practices scores of Proxy Population (5-6 years old)

Locations	Knowledge (%)			Attitude (%)			Practices (%)		
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
All (n=527)	5.5	68.1	26.4	30.9	52.0	17.1	4.2	56.4	39.4
Tumpang (n=233)	6.9	68.7	24.5	33.5	49.4	17.2	5.6	52.8	41.6
Pasir Mas (n=294)	4.4	67.7	27.9	28.9	54.1	17.0	3.1	59.2	37.8

## 4.2 The Effectiveness of Health Promotion Intervention Program (TIPTOP program)

### 4.2.1 Socio-demographic characteristics of the family of 2 year old toddlers at baseline (actual study population).

Table 4.8 showed that the intervention and control group is similar in all aspects of socio-demographic characteristics at baseline.

Table 4.8 Socio-economic status and demographic of the family of toddlers at 2-4 years old.

SES Variables	n=81		P-value
	Intervention n (%)	Control n (%)	
Mother's age category			0.747
19-29 years	14(35)	13(31.7)	
20-39 years	21(52.5)	23(56.1)	
40-49 years	5(12.5)	4(9.8)	
> 50 years	0	1(2.1)	
Mother's Race			0.368
Malays	39(97.5)	40(97.6)	
Chinese	0	1(2.4)	
Indians	0	0	
Others	1(2.5)	0	
Mother's level of education			0.563
Primary	4(10)	2(4.9)	
Secondary	21(52.5)	20(48.8)	
Tertiary	15(37.5)	19(46.3)	
Mother's occupations			0.053
Not working	20(50)	17(41.5)	
Employee	18(45)	14(34.1)	
Employer	2(5)	10(24.4)	
Water supply			0.316
Well (ordinary well, well with pump)	8(20)	7(17.1)	
Pipe water (state water supply)	30(75)	34(82.9)	
Rain	0	0	
Others	2(5.0)	0	
Mothers age *	32.40 ± 5.724	32.49 ± 5.891	0.946
Household income*	1945.00 ± 1 456.163	2266.59 ±	0.369
<RM720	11(27.5)	1730.629	
>RM721	29(72.5)	11(26.8)	
		30(73.2)	
Family members*	5.50 ± 2.075	5.46 ± 1.748	0.932
Allocation money for food*	653.75 ± 414.541	760.24 ± 624.622	0.370

\* Mean and standard deviation

Level of significance was set at 0.05



#### 4.2.2 Effectiveness of TIPTOP Program in Controlling Early Childhood Caries (ECC).

Table 4.9 showed the effectiveness of the TIPTOP program in controlling ECC (dmf status at baseline compared to final intervention). There were no missing (mt) or filled teeth (ft) in both intervention and control group at baseline and at final intervention. While, there was an increase in ECC in both intervention and control group cohort after one year and six months of the study period; however, the increase in ECC was significantly greater in the control group than the intervention group (p=0.006).

Table 4.9 Effectiveness of TIPTOP program in controlling ECC (dmf status at baseline and final intervention)

	Intervention (n=40)			Control n=41)			P value
	d (SD)	m	f	d (SD)	m	f	
Pre (baseline at 2 yrs old)	0	0	0	0	0	0	0.006*
Post ( at 3 yrs 8 month)	2.10(1.92)	0	0	3.20(2.55)	0	0	
Mean difference(dmf)	2.10(1.92)	0	0	3.20(2.55)	0	0	
P value	0.000*			0.000*			

Level of significance was set at 0.05

Table 4.10 showed the effectiveness of the Health Promotion Intervention by ECC category. The majority of the intervention group fell into the “low or no caries” category (77.5%) as compared to the control group (only 58.5%) at the end of the study period. It was also noted that there was almost double the number of caries-free children in the intervention group (37.5%) as compared to the control group (19.5%). Furthermore, there was no child in the “high caries category” (ie. dmf >7) in the intervention group as compared to the control group (9.8%). The odds ratio of intervention group having early childhood caries was lower (OR= 0.805) than the control group.

Table 4.10 Effectiveness of Health Promotion Intervention: by ECC category

dmf category	Intervention		Control		P value	OR	(95% CI)
	Pre n (%)	Post n (%)	Pre n (%)	Post n (%)			
No caries	0	15 (37.5)	0	8 (19.5)	0.036	0.805	(0.656-0.986)
Low (1-3)	0	16 (40.0)	0	16 (39.0)			
Moderate (4-6)	0	9 (22.5)	0	13 (31.7)			
High (>7)	0	0	0	4 (9.8)			
Total	40 (0)	40 (100)	41 (0)	41 (100)			

Level of significance was set at 0.05

Table 4.11 Effectiveness of TIPTOP program on Nutritional Status: Anthropometry measurements among toddlers aged 2-4 years old -Weight-for-age (WAZ), Height-for-age (HAZ) and BMI-for-age.

Indicators	Intervention		Control		P value*
	Mean (SD)	Mean difference	Mean (SD)	Mean difference	
Weight-for-age					0.970*
Pre	12.31(2.34)†*	0.56(0.90)**	12.33	2.17(0.99)**	< 0.001†
Post	15.34 (2.29)†		(2.63)†*		< 0.001††
			14.50 (2.66)†		< 0.001**
Height-for-age					0.990*
Pre	89.15 (6.85) †*	11.63(4.83)**	89.14	8.91(3.89)**	< 0.001†
Post	100.77 (6.52)†		(7.71)†*		< 0.001††
			98.05 (7.19)†		0.038**
BMI-for-age					0.850*
Pre	15.39(1.52)†*	-0.44	15.39	-0.39(1.51)**	0.030†
Post	14.92 (1.46)†	(0.39)**	(1.49)†*		0.110††
			15.00 (1.54)†		0.930**

\* Comparing at baseline between groups (Intervention vs Control)

Comparing between pre and post within groups († Intervention-pre vs post)

(†† Control- pre vs post)

\*\*Comparing the mean differences between groups (Intervention vs Control)

Level of significance was set at 0.05

### **4.2.3 Effectiveness of TIPTOP Program in Controlling Nutritional Status (Anthropometry Measurements).**

Table 4.11 showed the effect of TIPTOP program in contributing to general health (as measured by nutritional status anthropometry) at baseline and final intervention. There were no significant difference of weight-for-age, height-for-age and BMI-for-age in both intervention and control group at baseline ( $p > 0.05$ ).

However, there were statistically significant increases in weight-for-age and height-for-age from baseline to final intervention in both intervention and control group respectively ( $p < 0.05$ ). BMI-for-age showed the reduction from baseline to final intervention with the greatest reduction in the intervention group ( $p = 0.03$ ).

Thus, the mean difference in weight-for-age was higher in the control group as compared to the intervention group ( $p < 0.001$ ). While, increasing of height-for-age was greater in intervention group than the control group ( $p = 0.03$ ). However there was no significant difference of mean between intervention and control group for BMI-for-age.

Table 4.12 showed the effectiveness of the Health Promotion Intervention program by category of nutritional status anthropometry. Almost three-quarters (72.5%) of toddlers in the intervention group was normal in weight-for-age at the final intervention. While, only one-third (39%) were in the “normal” category in control group. In addition, almost one-half (48.8%) of children in the control group was in the “underweight” category of weight-for-age. Furthermore there was no child who was in the “moderately” or “severely” underweight category in the intervention group as compared to the control (9.8%).

More than three-quarters (80%) had normal height-for-age (HAZ) at the final intervention of the intervention group and only 20% of them were categorized as “stunted”. In contrast, only one-third (34.1%) of toddlers in the control group had “normal” height-for-age; while nearly two-thirds (65.9%) in the control group was

“stunted” and “moderately stunted” in the control group at the end of the one year and six months study period.

Table 4.12 Effectiveness of TIPTOP program on Nutritional Status: Anthropometry measurements changes (2-4 years old)-Weight-for-age (WAZ), Height-for-age (HAZ) and BMI-for-age.

Indicators	Intervention (n=40) (%)		<i>P</i> value	Control (n=41) (%)		<i>P</i> value
	Pre	Post		Pre	Post	
<b>Weight-for-age (WAZ)</b>						
Severe underweight	0	0	0.010	0	0	<0.001
Moderate Underweight	3(7.5)	0		4(9.8)	4(9.8)	
Underweight	22(55)	11(27.5)		18(43.9)	20(48.8)	
Normal	14(35)	29(72.5)		18(43.9)	16(39.0)	
Overweight	1(2.5)	0		1(2.4)	1(2.4)	
<b>Height-for-age (HAZ)</b>						
Normal	15(37.5)	32(80.0)	0.000	22(53.7)	14(34.1)	0.008
Stunting	22(55.0)	8(20.0)		15(36.6)	22(53.7)	
Moderate stunting	3(7.5)	0		4(9.7)	5(12.2)	
<b>BMI-for-age</b>						
Severe thinness	2(5.0)	0	0.000	2(4.9)	0	0.082
Thinness	6(15.0)	2(5)		7(17.1)	8(19.5)	
Normal	29(72.5)	34(87.5)		27(65.9)	25(61)	
At risk of overweight	1(2.5)	3(7.5)		5(12.0)	5(12.2)	
Overweight	2(5.0)	0		0	3(7.3)	

Level of significance was set at 0.05

The majority (87.5%) of toddlers in the intervention group had normal BMI-for-age at the final intervention. The proportion of malnutrition in the intervention group was lower (ie. only 12.5%) consisting of 5% thinness and 7.5% at risk of overweight. In contrast, the control group showed less than two-thirds (61%) of toddlers had normal BMI-for-age; and more than one-third (39%) had malnutrition (ie. thinness 19.5% and at risk of overweight/overweight 19.5%).

#### **4.2.4 Effectiveness of TIPTOP Program in Controlling Nutritional Status (Nutrients and Added Sugar) Intake.**

Table 4.13 showed the effectiveness of the TIPTOP program in controlling nutrients and added sugar intake at baseline and final intervention. The overall nutrients intake between intervention and control group at baseline showed no significant difference ( $p>0.05$ ). At the end of the program, in the intervention group, there were reductions in calorie, vitamin A, zinc and added sugar intake from baseline to final intervention ( $p<0.05$ ).

In addition, the calcium intake increased by nearly 20 percent (ie. 19.7%) (see Table 4.14) from baseline to the end of study period in the intervention group. There were no significant differences between baseline and final intervention for protein, fat, vitamin C and iron intake ( $p>0.05$ ).

In the control group, the iron intake had reduced from baseline to the end of intervention in control group ( $p<0.05$ ). However, the sugar intake had significantly increased ( $p<0.05$ ). There were no significant differences for others nutrients in the control group.

Thus, in comparing the mean difference between intervention and control groups, there were significant differences in terms of calorie, protein, fat, vitamin C, calcium, iron and added sugar intake ( $p<0.05$ ), where the intervention group fared generally better than the control.

Table 4.13 Effectiveness of Health Promotion Intervention on Nutritional Status: Nutrient Intake

Variables	Intervention Group			Control Group			P-value
	Pre Mean (SD)	Post Mean (SD)	Mean different (SD)	Pre Mean (SD)	Post Mean (SD)	Mean different (SD)	
Calorie (kcal)	1018.0†* (328.6)	892.63† (299.88)	125.38** (377.15)	1125.18†* (356.87)	1198.11† (298.55)	-72.93** (235.92)	0.160* 0.040† 0.060†† 0.010**
Protein (g)	27.81†* (10.05)	31.22† (13.66)	-3.40** (14.65)	28.04†* (6.81)	25.49† (6.91)	2.55** (8.98)	0.900* 0.150† 0.070†† 0.046**
Fat (g)	37.44†* (13.11)	32.84† (13.83)	4.60** (16.00)	37.87†* (20.35)	42.27† (17.50)	-4.39** (18.49)	0.910* 0.080† 0.140†† 0.006**
Vitamin C (mg)	35.29†* (16.28)	42.73† (23.22)	-7.43** (26.50)	36.89†* (10.53)	32.48† (10.96)	4.41** (15.14)	0.590* 0.080† 0.070†† 0.030**
Vitamin A (ug)	470.06†* (325.26)	357.69† (257.73)	12.37** (339.15)	448.73†* (205.74)	418.73† (283.20)	29.99** (232.43)	0.730* 0.040† 0.410†† 0.390**
Calcium (mg)	383.07†* (193.35)	481.34† (166.32)	-98.27** (215.43)	404.56†* (199.57)	340.62† (220.13)	63.95** (241.36)	0.620* 0.000† 0.090†† 0.001**
Iron (mg)	6.85†* (2.36)	7.30† (2.50)	-0.45** (3.27)	7.36†* (1.91)	5.54† (1.29)	1.83** (1.39)	0.290* 0.300† 0.001†† 0.001**
Zinc (mg)	4.66†* (2.29)	3.71† (1.79)	0.96** (2.72)	5.36†* (1.88)	5.19† (3.39)	0.17** (3.62)	0.140* 0.030† 0.770†† 0.340**
Added sugar (g)	53.21†* (29.12)	27.46 † (20.84)	-25.75** (31.69)	52.47* (21.69)	70.08† (37.12)	17.59** (30.13)	0.890* 0.001† 0.001†† 0.001**

\* Comparing at baseline between groups (Intervention vs Control)

† Comparing between pre and post within groups († Intervention-pre vs post)

(†† Control- pre vs post)

\*\*Comparing the mean differences between groups (Intervention vs Control)

Level of significance was set at 0.05

Table 4.14 showed the comparison of nutrients profile and added sugar intake at baseline and final intervention with recommended RNI (2005), American Heart Association and WHO, (2003) standards. For the intervention group, there was improvement in energy and zinc intake which was excessive at baseline to normal intake at final intervention. There were improvements in protein, calcium, iron and vitamin C intake based on the total intake which increased from the baseline to final intervention that can contribute to better health status in the intervention group.

However, vitamin A, and fat intake were not adequate at the end of program in the intervention group. There was almost one-half (42.9%) reduction of added sugar intake in the intervention group, from baseline to the end of intervention.

In the control group, there were improvements of protein, iron, zinc, vitamin C and vitamin A intake based on the excessive intake at the baseline to nearly normal intake at the end of intervention. However, there was an increase of energy intake after one and half year of study period for both sexes in the control group. There was inadequate calcium and fat intake in the control group at baseline and after 18 months of study period in control group. Furthermore, added sugar intake had increased by 29.3% in the control group at the end of the study

Table 4.14 Effectiveness of Health Promotion Intervention on Nutritional Status: Comparison of Nutrients Profile and Added Sugar Intake at baseline and final intervention with Recommended Nutrient Intake.

Nutrients	RNI/day	Intervention			Control		
		Pre (%)	Post (%)	*Difference (b-a) (%)	Pre (%)	Post (%)	*Difference (b-a) (%)
Energy (kcal)*	980-boys	101.6	96.2	-5.4	116.8	124.6	7.8
	910-girls	114.8	91.4	-23.4	121.4	129.0	7.6
Protein (g)	17	163.6	183.6	20	164.9	149.9	-15
Calcium (mg)*	500	76.6	96.3	19.7	80.9	68.1	-12.8
Iron (mg)*	6	114.2	121.7	7.5	122.7	92.3	-30.4
Zinc (mg)	4.1	113.7	90.5	-23.2	130.7	126.6	-4.1
Vitamin C (mg)*	30	117.6	142.4	24.8	123.0	95.7	-27.3
Vitamin A (ug)*	400	117.5	89.4	-28.1	112.2	104.7	-7.3
Fat** (g)	52-boys	69.1	67.3	-1.8	66.7	86.0	19.3
	50-girls	78.5	60.4	-18.1	82.5	79.4	-3.1
Added sugar (g)***	60g	88.7	45.8	-42.9	87.5	116.8	29.3

\*Recommended by Malaysia Nutrient Intake (2005)

\*\* Recommended by American Heart Association

\*\*\* Recommended by WHO (2003)

Shaded cells showed improvement in consumption.

$$\text{Percentage} = \frac{\text{Mean of nutrient intake}}{\text{RNI}} \times 100$$



#### 4.2.5 Effectiveness of TIPTOP Program in Influencing Dietary Habits: Sugary Foods and Drinks; Fruits and Cariostatic Foods.

Scores reflecting frequency of consumption of the above food items at baseline (pre-) and at the end of the intervention program (post-) were computed using the equation adopted from Reaburn, Kronl & Lau (1979), Chee et al (1996) and Khor & Sharif (2003), as displayed in Table 4.15(a) and 4.15(b). These scores will be able to compare the differences of consumption of these food items systematically.

Table 4.15(a) Effectiveness of Health Promotion Intervention on Dietary Habits (Sugary Foods & Drinks): Comparison between Score.

Type of foods	Score of FFQ					
	Intervention Group			Control Group		
	Pre	Post	*Difference (b-a)	Pre	Post	*Difference (b-a)
1). Cakes						
Chocolate cake	37.8	39.2	1.4	40.0	41.8	1.8
Fruit cake	32.1	27.1	-5.0	28.3	31.1	2.8
Sponge cake	33.9	30.4	-3.5	30.6	30.3	-0.3
Banana cake	40.4	33.9	-6.5	34.1	34.5	4.0
Plain cake	38.6	33.6	-5.0	37.2	44.2	7.0
2). Biscuits/ Cookies						
Coconut biscuit	28.6	25.7	-2.9	24.0	25.0	1.0
Cream cracker biscuit with sugar	48.6	45.0	-3.6	46.4	47.0	0.6
Chipsmore biscuit/tiger	49.6	46.4	-3.2	45.2	53.3	8.1
Marie biscuit	40.0	35.4	-4.6	35.8	41.4	5.6
Chocolate cookies	47.9	43.9	-4.0	35.5	38.9	3.4
3) Sweets/Candy						
Milk chocolate	48.9	45.4	-3.5	46.0	52.2	6.2
Kit Kat chocolate	33.9	35.7	1.8	30.6	31.7	1.1
Chocolate with raisin	35.7	33.2	-2.5	33.7	33.8	0.1
“Cokelat” (all types of sweets)	53.2	43.9	-9.3	56.4	66.5	10.1
Wafer (krim,coklat dll)	43.6	41.4	-2.2	41.5	43.9	2.4

4). Traditional						
Malaysian <i>kuih</i>						
Donut	51.4	48.2	-3.2	50.2	51.3	1.1
Kuih bom/lengur	30.7	26.8	-3.9	24.9	26.1	1.2
Kuih kasui	31.8	27.9	-3.9	26.5	28.6	2.1
Kuih lapis	32.5	32.5	0	32.7	28.4	4.3
Kuih seri muka	28.2	26.4	-1.8	28.5	29.3	0.8
Kuih Akok	36.8	33.9	-2.9	34.8	35.5	0.7
Kuih Bahulu	38.9	34.6	-4.3	34.1	35.2	1.1
Kuih Apam	32.9	38.2	5.3	29.0	30.0	1.0
Karipap	43.6	39.3	-4.3	39.0	45.6	6.6
Pulut panggang	36.1	31.8	-4.3	32.7	34.8	2.1
Kuih Pau	32.9	29.6	-3.3	31.3	31.0	-0.3
Jala Mas	22.1	22.1	0	20.9	21.9	1.0
Tahi itik	19.3	19.3	0	19.9	21.3	1.4
Lopat tikam	31.1	32.2	1.1	23.3	26.4	3.1
Bunga tanjung	19.3	19.3	0	20.2	19.9	-0.3
5). Morning						
Breakfast						
Bran flakes	28.9	26.1	-2.8	30.3	30.3	0
Coco crunch	43.2	37.9	-5.3	48.9	48.9	0
Emping jagung (Corn flakes)	35.7	28.6	-7.1	38.7	34.4	-4.3
6). Non-carbonated						
drink						
Chocolate drink (with sugar or sweetened milk)/Milo	70.4	63.9	-6.3	68.6	68.3	-0.3
Ribena	52.9	52.1	-0.8	47.4	53.0	5.6
Syrup	45.7	41.4	-4.3	43.6	48.8	5.2
“Slurpy”	23.2	21.4	-1.8	22.3	20.8	-1.5
Soy drink (sweet)	45.7	39.6	-6.1	43.2	52.6	9.4
Cordial	24.3	22.9	-1.4	39.4	42.8	3.4
7). Carbonated drink (all brands)	24.3	22.1	-2.2	32.3	22.2	-10.1
8). Juices						
Apple juice	26.0	26.0	0	29.3	33.0	3.7
Grape juice	30.4	27.5	-2.9	33.4	32.3	-1.1
Lemon juice	25.0	24.7	-0.3	29.2	24.0	-5.2
Orange juice	36.4	32.5	-3.9	35.2	39.4	4.2
Pineapple juice	16.4	16.4	0	22.9	19.7	-3.2

9). Desserts							
“Bubur kacang hijau”	38.2	32.5	-5.7	30.0	36.6	6.6	
“Bubur kacang merah”	29.3	25.7	-3.6	26.5	31.0	4.5	
“Pengat keledak”	23.9	21.1	-2.8	24.7	22.7	-2.0	
“Pengat pisang”	33.2	27.1	-6.1	28.9	32.0	3.1	
“ColeRojak (mee,buah)”	27.1	23.6	-3.5	23.4	23.7	0.3	
10). Raisins and other dried fruits							
	42.9	37.9	-5.0	50.2	52.6	2.4	
11). Miscellaneous							
Jem	34.3	30.7	-3.6	33.5	38.3	4.8	
Honey	36.4	33.6	-2.8	28.9	31.3	2.4	
Ice-cream	53.2	44.6	-8.6	50.1	52.3	2.2	
“Kaya”	42.9	38.9	-4.0	36.2	42.4	6.2	
“Lok Chen”	30.4	37.5	7.1	26.1	26.8	0.7	
Lolipop	32.9	26.1	-6.8	27.5	30.6	3.1	

Mean (SD) Intervention = 3.23±2.36

Mean (SD) Control = -1.46±3.79

P= 0.000

Significant value, p<0.05

Shaded cells showed improvement in consumption.

Table 4.15(a) showed the effectiveness of Health Promotion Intervention on Dietary Habits (Sugary Foods & Drinks) and comparison between score at pre- and post- intervention. In the intervention group, there was slight improvement (ie. reduction) in the consumption of fruit cake, sponge cake, banana cake and plain cake from baseline to final intervention. However, there was an increased consumption of chocolate cake (score difference +1.4) at the post intervention of intervention group. While in the control group, there was very little improvement only in sponge cake consumption (-0.3), whilst the consumption of others types of cakes had increased substantially at the end of study period.

The consumption of all types of biscuits/cookies had improved (ie. reduced) in the intervention group. In the control group, the consumption of all types' biscuits/cookies had increased (ie. became worse) from baseline to final intervention.

The consumption of almost all types of sweets/candy had been reduced in the intervention group except for “kitkat” consumption which slightly increased at the end of study period. The improvement of “cokelat” (or sweets) was substantial (-9.3) in the intervention group while in control group, consumption was markedly increased (+10.1).

The intervention group had reduced their consumption of all traditional Malaysian *kuih* except for “kuih apam” and “lopat tikam”. For “kuih lapis” and “bunga tanjung” there was no change at baseline and final intervention. In the control group there was increased consumption of all traditional kuih items, with “curry puff” showing the largest increase (+ 6.6) at the end of intervention, except for the consumption of “kuih pau” and “bunga tanjung” which was slightly reduced.

The consumption of food items for morning breakfast had slightly reduced in the intervention group. For control group, only “corn flakes” consumption was reduced, while there was no change for “bran flakes” and “coco crunch” consumption at post intervention.

The intervention group had shown improvements (ie. reductions) in the consumption of all non-carbonated drinks; whereas in the control group, all items had increased except “milo” and “slurpy” consumption. For carbonated drink (all brands) which was identified as the most cariogenic item for dental caries there were reductions in both intervention and control group. However the reductions was larger in the control group (-10.1) as compared to the intervention group (-2.2), mainly because the intake was very high at baseline in the control group.

The improvements (reductions) in consumption of juices were observed in grape, lemon and orange juice in the intervention group, but there was no change in apple juice and pineapple juice intake from the baseline to final intervention. While in the control group, the consumption of grape juice, lemon juice and pineapple juice

improved (reduced). However orange (4.2) and apple juice (3.7) consumption increased at the final intervention.

In intervention group, all types of “desserts”, showed marked reductions as well as “raisins and other dried fruits” which was also reduced (ie. improved) from baseline to final intervention; whereas in the control group there was an increase in all “dessert” items and “raisins/dried fruits” items except “pengat keledak”.

There were improvements (ie. reductions) in the majority of “miscellaneous” items with the largest improvement in ice-cream consumption (-8.6) in the intervention group. However, there was an increased consumption for “lok chen” at the final intervention in intervention group. In the control group, however, all types of “miscellaneous” food items had increased from baseline to final intervention.

Finally, comparing the improvement of consumption of sugary foods and drinks between the groups, there was larger improvement in intervention group ( $p=0.00$ ) as compared to the control group.

Table 4.15 (b) Effectiveness of Health Promotion Intervention on Dietary Habits (Fruits and Cariostatic Foods Intake): Comparison between FFQ Score of intervention and control group.

Type of foods	Score of FFQ					
	Intervention Group			Control Group		
	Pre	Post	*Difference (b-a)	Pre	Post	*Difference (b-a)
1).Fruits	37.9	36.1	-1.8	47.3	39.3	-8
Apple	46.1	66.1	20	45.9	53.2	7.3
Mango	39.3	56.8	17.5	39.4	47.1	7.7
Papaya	38.2	32.3	-5.7	42.8	42.2	-0.6
Grapes	47.9	60.4	12.5	32.4	35.9	2.2
Oranges	50.0	60.4	10.4	47.2	52.9	5.7
Banana	48.9	65.4	16.5	45.3	50.8	5.5
Watermelon	40.7	62.1	21.4	40.0	45.0	5
Guava						
2). Cariostatic foods (yogurt)	33.6	61.1	27.5	34.9	50.2	15.3

Mean (SD) Intervention = 13.14±10.83

Mean (SD) Control = 2.52±4.89

P= 0.024

Significant value, p<0.05

Shaded cells showed improvement in consumption.

Table 4.15(b) showed the effectiveness of health promotion intervention on dietary habits involving fruits and cariostatic foods intake by comparison between FFQ scores at pre- and post- intervention in both groups. There was large improvement of fruits intake (ie. increase) in the intervention group at pre- and post- intervention except apples and grapes intake. Both intervention and control group showed increase in yogurt intakes (considered as a cariostatic food). However the increase was significantly higher in the intervention group (+27.5) as compared to the control (+15.3). Similarly the improvements (increase) in fruits intake were markedly higher in all fruit items in the intervention group as compared to the control group. The differences in consumption of fruits and yogurt between intervention and control groups was statistically significant (p=0.024).

#### **4.2.6 Effectiveness of intervention program (TIPTOP Program) in improving Knowledge, Attitude and Practices (K/A/P) of mothers.**

Table 4.16 showed the effect of TIPTOP program in improving the mother's knowledge, attitude and practices (K/A/P) at baseline and final intervention of intervention and control group. There were no significant differences of mother's knowledge, attitude and practice scores between intervention and control group at baseline ( $p < 0.05$ ). However at the end of the program, there were significant increases in knowledge, attitude and practices scores of mother's in the intervention group when compared to baseline ( $p < 0.05$ ). In contrast, only practices scores was significantly different at baseline and final intervention ( $p < 0.05$ ), but not for knowledge and attitude ( $p > 0.05$ ) in the control group.

There was greater increase of mother's knowledge in intervention group compared to the control group ( $p < 0.01$ ). However, there was no significant difference of attitude scores between intervention and control group after one and half year of intervention ( $p > 0.05$ ). The practices score improvement was greater in the intervention group compared to the control group ( $p < 0.001$ ).

The KAP scores were arbitrarily divided into low, moderate and high categories. Table 4.17 showed the effectiveness of Health Promotion Intervention by knowledge, attitude and practices categories. The majority (82.5%) of mothers in the intervention group had high knowledge of nutrition and oral health after one and half year intervention as compared to baseline. While, just over one-third (39%) of the control group at final intervention was in the high knowledge category in nutrition and oral health. More than one-half (58.5%) showed no change in knowledge categories based on 58.5% who were in the moderate category at baseline and final intervention after 18 months of study period in control group.

Nearly two-thirds (65%) of mothers was in the high attitude category at post intervention in the intervention group; as compared to only less than one-half (46.3%) of mothers in the high attitude category in the control group with small percentage changes from baseline (43.9%) to final intervention (46.3%) ( $p < 0.05$ ). There was no “low attitude” category of mothers in the intervention group; as compared to 12.2% of mothers in the low attitude category in the control group after 18 months of study period.

Almost all mothers (95%) in the intervention group was in the “high practices” score category after 18 months of intervention period. While in the control group, just over one-half (58.5%) of mothers was in the “moderate” category of nutrition and oral health practices at final intervention. Less than one-half (41.5%) was in the “high practices” score category in control group. Both, mothers in the intervention and control group, showed significant changes of practices category ( $p < 0.05$ ).



Table 4.16 Effectiveness of Health Promotion Intervention on Knowledge, attitude, practices

Indicators	Intervention		Control		P value*
	Mean (SD)	Mean difference	Mean (SD)	Mean difference	
<b>Knowledge</b>					
Pre	13.60(2.64) †*	-2.60(1.43)**	12.61(3.14) †*	0.22(3.31)**	0.130*
Post	16.20(2.42) †		12.39(3.08) †		<0.001†
					0.670††
					<0.001**
<b>Attitude</b>					
Pre	4.35(1.21) †*	-0.55(0.81)**	4.20(1.33) †*	0.00(1.55)**	0.590*
Post	4.90(1.28) †		4.20(1.49) †		<0.001†
					1.000††
					0.094**
<b>Practices</b>					
Pre	10.00(1.84) †*	-1.65(1.29)**	10.15(1.57) †*	1.12(2.11)**	0.700*
Post	11.65(1.23) †		9.02(1.59) †		<0.001†
					<0.001††
					<0.001**

\* Comparing at baseline between groups (Intervention vs Control)

† Comparing between pre and post within groups († Intervention-pre vs post)  
(†† Control- pre vs post)

\*\*Comparing the mean differences between groups (Intervention vs Control)

Level of significance was set at 0.05

Table 4.17 Effectiveness of Health Promotion Intervention (TIPTOP Program) on Knowledge, Attitude and Practices: Changes in K/A/P score categories.

Category	Intervention Group (n=40) (%)		P value	Control Group (n=41) (%)		P value
<b>Knowledge</b>	<b>Pre</b>	<b>Post</b>		<b>Pre</b>	<b>Post</b>	
Low	0	0	0.000	1(2.4)	1(2.4)	1.000
Moderate	19(47.5)	7(17.5)		24(58.5)	24(58.5)	
High	21(52.5)	33(82.5)		16(39)	16(39)	
<b>Attitude</b>	<b>Pre</b>	<b>Post</b>		<b>Pre</b>	<b>Post</b>	
Low	2(5)	0	0.000	4(9.8)	5(12.2)	0.388
Moderate	20(50)	14(35)		19(46.3)	17(41.5)	
High	18(45)	26(65)		18(43.9)	19(46.3)	
<b>Practices</b>	<b>Pre</b>	<b>Post</b>		<b>Pre</b>	<b>Post</b>	
Low	0	0	0.000	0	0	0.008
Moderate	12(30)	2(5)		12(29.3)	24(58.5)	
High	28(70)	38(95)		29(70.7)	17(41.5)	

Level of significance was set at 0.05

### 4.3 Summary of results

In summary, parents in the proxy population were found to be comparable in all aspects of socio-demographic characteristics. Almost every child in both the study districts were affected by caries (97.9%) and three-quarters of them have more than 7 teeth affected by caries.

The majority of preschool children in the proxy population had malnutrition consisting of majority (50.5%) who were underweight, moderate underweight and severe underweight (WAZ), 40.1% were stunted (HAZ) and one-third (31.1%) were underweight (BMI-for-age). Majority of nutrients were not adequate as compared to daily recommended intake.

Furthermore, added sugar consumption was three times higher (205.1%) than the WHO (2003) recommendation. For dietary habits of sugary foods and drinks, “milo” (with sugar or sweetened condensed milk) consumption was the highest FFQ score (84.6) followed by “*cokelat*” or all types of sweets (75.3) and ice-cream (67.5%). More than one-half of parents in the proxy population scored in the “moderate” category in knowledge, attitude and practices.

Majority of toddlers in intervention group had low or no caries (77.5%) compared to control group (only 58.5%). The percentage of caries free children was double (37.5%) in intervention group as compared to control. The odds ratio of intervention group having early childhood caries is lower (OR=0.805) than the control group.

About three-quarters (72.5%) had normal WAZ, more than three-quarters (80%) had normal HAZ and majority (87.5%) had normal of BMI-for-age of toddlers in the intervention group. While in the control group, only one-third (39%) of toddlers were normal WAZ, one-third (34.1%) normal HAZ and more than one-third (39%) normal of BMI-for-age.

There was improvement in energy, protein, calcium, iron, zinc and vitamin C intake of toddlers in intervention group at the final of intervention. In addition, added sugar intake was reduced to nearly half (42.9%) from 88.7 % to 45.8% after 18 months of intervention period in intervention group. Only protein, iron, zinc, vitamin C and vitamin A intake were improved in the control group after 18 months of study period. Added sugar intake increased by about one-third at the post intervention in the control group.

Most sugary foods and drinks consumption in the intervention group improved (ie reduced) from baseline to final intervention while the opposite applies to the control group. There was large improvement of fruits and cariostatic foods consumption among toddlers in intervention group than control group.

The majority (82.5%) of mothers' knowledge was high, two-thirds (65%) scored high attitude and almost all (95%) had high practices scores in the intervention group after receiving the TIPTOP program package. In contrast, the control group which followed the existing toddlers oral health program conducted by Oral Health Division, Ministry of Health showed just over one-third (39%) with high knowledge, nearly one-half (43.9%) with high attitude and more than one-half (58.5%) with high practices score in control group, at the end of the study period.

In conclusion, both intervention and control groups which started initially with no caries at about two years of age showed different oral and general health outcomes at the end of the 18 months study period. There were statistically significant improvements of oral health and general health status (nutritional status, dietary habits and sugary intake and knowledge, attitude and practices among mothers) of toddlers in the intervention group as compared to the control group.